

CONTRIBUTIONS TO THE KNOWLEDGE OF THE REPTILES OF THE KARROO FORMATION.

By Dr. E. C. N. VAN HOEPEN, M.I.

3. The Skull and Other Remains of *Lystrosaurus Putterilli* n. sp.

SOME time ago our collector at Harrismith, Orange Free State, found the remains of a giant *Lystrosaurus*. The remains proved to consist of the skull, of which the lower jaw was badly damaged, and of different bones of the fore- and hind-legs, the shoulder girdle and the pelvis with some ribs and vertebrae. All these bones are greatly displaced, and were really scattered through the matrix. It was, therefore, not impossible that the missing parts had not been observed by the discoverer and that they might be found by a closer investigation. Moreover, the fossil having been found in situ, some definite information might be obtained about the strata, its mode of deposition with regard to the conditions under which our fossil lived, its contemporaneous life, etc. The Director and Committee of this Institution therefore decided that a closer examination of the locality should take place. Circumstances, however, have not permitted us to follow up this decision as yet. This will be done as soon as possible and the results published here.

GENERAL REMARKS.

As already mentioned above, the different parts of the fossil do not occupy their original position with regard to each other. The front half of the lower jaw lies against the upper side of the right maxillary. The hinder portion of its right ramus is situated crossways in front of the right quadrate and squamosum. The position of the left scapula is exactly behind the middle of the skull. The left humerus is situated at right angles to the axis of the skull, while the right humerus lies parallel with this axis. The right coracoid and procoracoid are at the proximal end of the right humerus and completely under the skull; the corresponding bones of the left side have not been found. The right (?) clavicle is also situated under the skull and parallel with its axis. The left (?) ulna is situated above and behind the right squamosum. Ribs and vertebrae are scattered among the other remains. The sacrum covers part of the right squamosum and the left ulna. The left ilium is situated at some distance behind the skull with the outside up and the longest dimension at right angles to that of the skull. The right ilium turns the inside up and has the largest dimension parallel to that of the skull. Pubis and ischium have not been found. The right femur is situated with the proximal end away from the skull.

How are we to explain this chaotic condition? What causes have thrown all the bones of this fossil in a heap, and why is it that the bones of others occur all in their original relative position? It is my intention to try and find an answer to these and other questions relative to this

subject, on a future occasion. I will avail myself, however, of the present opportunity to give an outline explanation of the condition of *L. Putterilli*. I do this especially, because another explanation of the condition of certain fossils has recently been given by WATSON (5), with which I cannot agree.

The bones of *Putterilli* have been displaced in all directions and this has most probably not taken place after their enclosure in matrix. In that case the bones must have been loosened from each other before or while they were covered up by sediment. The disintegration of the connective tissue may have taken place while the carcass was lying in water, but also while lying on dry land. In either case the sedimentation must have been so slow that the disintegration had removed all connection between the bones before they were finally fixed in sediment.

Now, if *L. Putterilli* died on the bank of a river at low tide or in those parts outside the normal bed of a river, which are occasionally covered by floods, the bones of the animal could have been disconnected long before the arrival of the next flood. The rising water will in this case not only cover the bones with sediment, but will also displace them in all directions.

WATSON mentions several skeletons of *Pareiasaurus* and one of *Procolophon* in all of which the bones still articulated or nearly so. The condition of these fossils is part of his argument to prove that the Beaufort beds have been laid down largely by wind-action. The skeletons must then have been covered chiefly by aeolian sediment. It seems to me, however, that skeletons, of which the bones are practically still articulating, must have been covered up very quickly, so that the disintegration had not time enough to loosen the joints. This can easily happen when an animal drowns in a flood, but is certainly not normal with aeolian sedimentation in areas of abundant life.

THE SKULL.

The general circumference of the skull is the same as that of *L. latirostris*. There is, however, a slight difference in the slope of the preorbital portion. In *latirostris* the angle between the preorbital portion and the top surface of the frontals and the parietals is in the vicinity of sixty degrees and in *Putterilli* this angle is nearer to forty-five degrees (see Pl. X).

General dimensions :

- Distance between the front edge of the jaw to the hinder end of the mutual suture of the parietals 283 mm.
- Distance from the hinder end of the left squamosum to the middle of the upper edge of the jaw..... 344 mm.
- Greatest breadth over the squamosa..... 283 mm.
- The height of the skull could not be ascertained, because the ventral as well as the occipital side are still covered with matrix. The height of the occipital plate, however, could be found :
- Distance from a line connecting the articulation surfaces of the quadrata to the front end of the mutual suture of the parietals on the top surface..... 154 mm.

In the skull of *latirostris* described some time ago (4) these dimensions are respectively: 180, 224, 169, and 115 mm., from which may be seen that the present skull is 10 cm. longer, 11 cm. broader, and 4 cm. higher.

The longest *Lystrosaurus* skull, *L. Mccaigi* SEELY, was described by BROOM in 1903 (2). A sketch of a side view was added, but neither sketch nor description can be used for accurate comparison. My own observations on this skull gave the following:

The distance between the front edge of the jaw and the
hinder end of the mutual suture of the parietals is 387 mm.

Breadth of the skull across the lower ends of the post-orbitals..... 178 mm.

Height of the occipital plate, taken from the lower ends
of the paroccipital processes to the front end of the
mutual suture of the parietals on the upper surface 197 mm.

The occipital plate is hollow and the upper surface of the skull is turned into a narrow furrow all through lateral compression. The pre-orbital portion has also been compressed laterally.

Breadth of the skull between the upper and hinder corners
of the orbital cavities..... 75 mm.

Length of the preorbital portion measured from the upper
edge of the jaw along the central ridge of the pre-
maxillary to the pair of protuberances on the pre-
frontals—
to the beginning of the protuberances..... 230 mm.
to the end of the protuberances..... 280 mm.
to the middle of the protuberances..... 255 mm.

Breadth of the premaxillary above the exterior nares.. 48 mm.

Length of the upper surface of the premaxillary..... 165 mm.

The length of the septomaxillary measured along the
suture with the maxillary is at least 75 mm. and
may even be 100 mm.

The distance from the hinder end of the septomaxillary
to the place where the suture between the nasal
and the premaxillary disappears in the nose..... 64 mm.

Length of the nasals..... 122 mm.

Breadth of the preparietal..... 16 mm.

(The preparietal may have been as broad as that of *Putterilli*.)

Diameter of the orbital cavity antero-posteriorly..... 70 mm.

If these dimensions are compared with those of *Putterilli* it will be seen that the skull of *Mccaigi* is much longer and higher than that of *Putterilli*. On the other hand the skull of *Putterilli* is absolutely broader between the upper and hinder corners of the postorbital cavities than the skull of *Mccaigi* (see under Frontals). Even if some allowance is made for compression the skull of *Mccaigi* still remains relatively narrower. I have therefore concluded that the two specimens belong to different species. Other differences will be considered in discussing the bones composing the skull of *Putterilli*.

THE PREMAXILLARY.

This bone has the same general shape as that of *latirostris*, but in detail it shows many peculiar differences. As in *latirostris* it is in contact with the nasals, the septomaxillaries, and the maxillaries. The sutures with these bones are, however, not clear.

In *latirostris* the side-surfaces of the premaxillary make nearly a right angle with the upper surface. For comparison I have now ascertained that this angle is somewhat larger than sixty degrees. In *Putterilli* this angle is only thirty degrees. Thereby the skull of *Putterilli* acquires a much broader appearance, and this breadth is heightened by the relatively broader maxillaries. The proportion of the breadth across the maxillaries near the oral edge in *latirostris* to that of *Putterilli* is as 9.5 to 15.5. The proportion of the length of a perpendicular from the middle of the oral edge on a line which connects the front ends of the maxillaries behind the teeth in *latirostris* to that of *Putterilli* is as 5 to 6.7. Compared with *latirostris* the breadth of *Putterilli* has augmented with 6 cm. and the length of the mentioned perpendicular only with about 2 cm. The proportion in *latirostris* of the cited dimensions is as 9.5 to 5 or nearly as 2 to 1. The proportion of their increase in *Putterilli* is as 3 to 1. We therefore see that in the skull of *Putterilli*, compared with that of *latirostris*, the breadth of the oral portion increases relatively more than the already mentioned perpendicular, which might be called the height of the snout.

The central ridge on the premaxillary is very clear. The lateral ridges, however, are not so clear through the small angle between the upper surface and the lateral surfaces. This is especially the case near the oral opening where the upper surface curves without definite demarcation into the lateral surfaces. The lateral ridges are prominent above the external nares.

There is a transverse ridge between the nares, where the sutures with the nasals appear on the upper surface (Pl. XI). This ridge divides the grooves between the lateral and central ridges in two. An analogous feature has not been observed in *latirostris* nor in *Mccaigi*.

As in *latirostris* the lateral surfaces bend sharply inwards at the nostrils.

The general shape of the palatal surface (Pl. XII) is the same as that of *latirostris*. The acute angle which is formed by the front part of the palatal surface with the upper surface is, however, much more acute in *Putterilli*. In *latirostris* this is an angle of forty-five degrees and in *Putterilli* it is one of only fifteen degrees; it is nearly forty-five degrees in *Mccaigi*.

Dimensions :

Length of the upper surface.....	±135 mm.
Breadth of the bone where the suture with the nasals enters the nostrils.....	39.5 mm.
Mutual distance of the points where the sutures between premaxillary, maxillary, and septomaxillary meet under the nostrils.....	±56 mm.
Distance of these points to the oral edge, measured along the suture with the maxillary.....	70 mm.

Distance of these points to the central ridge on the upper surface.....	33 mm.
Breadth of the bone at the oral edge, where the sutures appear on the palate.....	70 mm.
Length of the parallel ridges on the palatal surface, about	36 mm.
Axial distance of these ridges, about.....	20 mm.

From this we see further that, while most of the dimensions are proportionately much larger, the breadth of the premaxillary is just as large as in *latirostris* (see 4). The mutual distance of the points under the nostrils mentioned above is in *Putterilli* 12 mm. larger than in *latirostris*, but the distance of these points to the central ridge is in both species the same. The mutual distance of the central ridge and the line connecting the mentioned points is therefore absolutely smaller in *Putterilli* than in *latirostris*.

THE MAXILLARIES.

These elements have also the same general shape as in *latirostris*. They even seem to be in touch with the same bones as in that species. However, the suture between the prefrontal and the lacrymal is very indistinct, and it could therefore not be made out whether the maxillary and the prefrontal touch each other or not.

The facial surface is not divided in two as in *latirostris*. As in that species the upper part is covered with fine striae, but on the other hand it does not form an angle with the lower part. There are broad and deep hollows between the nostrils and the orbital cavities, which are probably the result of severe pressure (Pl. X). The front part of the maxillaries is concave in a direction transverse to its length. As in *latirostris* there is a ridge, running near and parallel to the suture with the premaxillary. This ridge terminates at the hinder end of the nostril; it is high, narrow, and acute below the nostril, becomes flatter further forward and disappears before nearing the oral cavity. The ridge, which forms the outer edge of the maxillary, is thin and relatively acute.

Dimensions :

Distance between the point where the suture with the premaxillary disappears in the oral cavity and the hinder end of the jugal process (for so far visible).....	± 170 mm.
Greatest breadth near the orbital cavity.....	± 80 mm.
Average breadth of the lower part.....	45 mm.

The last dimension is in *latirostris* 42 mm. and therefore nearly as large as in *Putterilli*. The length of the bone in *latirostris* is, however, much less than in *Putterilli*. The maxillaries of these forms give therefore totally different proportions.

THE NASALS.

These are proportionately longer than those of *latirostris*. They are bounded by the premaxillary, the septomaxillaries, the maxillaries, the prefrontals, and perhaps the lacrymals and the frontals. The sutures are, however, too obscure in the vicinity of these bones to be able to decide with some certainty about it.

The nasals form a deep groove between the protuberances of the prefrontals. This groove is parted in two at the premaxillary by the central ridge of this bone. The nasals form broad ridges, which do not lie in the prolongation of the side ridges of the premaxillary as in *latirostris*, but which lie parallel along the outside of this prolongation. These ridges disappear towards the prefrontalia. The nasals direct a broad process towards the lacrymals.

Dimensions :

Distance from the lower end of the bone on the side ridges of the premaxillary to the upper end of the mutual suture, between 87 mm. and 115 mm.

Breadth of both bones together between the protuberances of the prefrontals..... 25 mm.

Breadth of both bones together over the processes towards the lacrymalia..... 116 mm.

The breadth of both bones between the protuberances on the prefrontals in *latirostris* is 28 mm., which is an absolute greater breadth than in *Putterilli*. The breadth across the already mentioned processes is in *latirostris* only 81 mm. No comparison can be made with the length of the nasals of *Meccaigi*, which has been given above, because that of *Putterilli* could not be made out with any certainty.

THE SEPTOMAXILLARIES.

The septomaxillaries are very large. They form a broad base for the exterior nares. Their broad hinder portion, which stands high up against the front margin of the nasals, makes a right angle with the front portion. It is bounded by the same bones as in *latirostris*.

Dimensions :

Length along the suture with the maxillary between 50 mm. and 55 mm.

THE LACRYMALS.

The boundaries of the lacrymal cannot be made out. The sutures with the jugal and the maxillary are clear enough, but there is no sign of a suture with the prefrontal. It cannot therefore be made out whether the lacrymal is in touch with the nasal.

The facial surface of the lacrymal between the maxillary and the edge of the orbital cavity is very narrow. The smallest dimension of this surface is about 6 mm.

THE JUGALS.

As these bones do not deviate from the usual, nothing of interest can be communicated about them.

Length of the facial surface..... 47 mm.

THE PREFRONTALS.

The prefrontals are broad, flat and thick. The sutures with the other facial bones have already been mentioned. The sutures with the frontals are totally different from those in *latirostris*. In this form they make an angle of ninety degrees with each other, while in *Putterilli* this

angle is 180 degrees (Pl. XI). In the middle they are only very slightly convex towards the face, while they bend broadly with the concavity forwards, towards the orbital cavity. This same bend occurs in *latirostris*, but there it is very small.

The outer surface is rough and convex. There are deep pits near the frontal edges of the bones, while the broad thick ridges, which divide the upper surface of the skull from the preorbital part, are situated nearer to the middle. The orbital surface has not been developed, because there were chances of breaking the fossil. The outer edge of the bone projects far over the orbital cavity.

Dimensions :

Greatest breadth.....	58 mm.
Greatest distance between the orbital edges of the bones	138 mm.
Greatest distance between the points where the sutures with the frontals pass over the orbital edges.....	93 mm.

As already mentioned on a former occasion, the latter distance in *latirostris* is 81 mm., and we therefore see that *latirostris* is only slightly narrower in this region.

THE FRONTALS.

The whole upper surface of the skull is concave, except that part which is formed by the prefrontals behind the prefrontal ridges (Pl. XI).

The edges of the frontals rise up high against the prefrontals and towards the borders of the orbital cavities. All along the mutual suture they show a broad but low thickening.

Dimensions :

Length of the mutual suture on the upper surface.....	37 mm.
Distance between the upper and hinder corners of the orbital cavities.....	95 mm.

If these and some of the dimensions given under the prefrontals are compared with those of *latirostris*, it will be seen that the orbital edges of the frontals in *latirostris* converge strongly backwards, while those of *Putterilli* converge forwards. At the most these may be taken to be parallel.

The lateral surfaces of the bones along the upper part of the orbital cavity, which have been found so perfect in *latirostris* (4, p. 17, 19, 21), are also present in this form. Those of the prefrontals stand vertical, but the lateral surfaces of the frontals incline towards the orbital edge, making a small angle with the orbital surface. The greatest breadth of the prefrontal ones is 17 mm. and of those of the frontals 18 mm.

Compared with *Meccaigi* it will be seen that *Putterilli* is 20 mm. broader between the upper and hinder corners of the orbital cavities.

THE POSTFRONTALS.

The sutures with the adjoining bones cannot be made out, and therefore all that can be said of the postfrontals is that they must be very broad at the edge of the orbital cavity.

THE POSTORBITALS.

The general shape of these bones is the same as in *latirostris*. In the larger form they are of course more strongly built. The bone possesses a large and nearly vertical hinder surface (Pl. X), which corresponds with the much more inclined hinder surface and the upper end of the lower surface of this bone in *latirostris*. In *latirostris* the upper and outer surface is separated from the hinder surface by a protuberance; in *Putterilli*, however, the upper and outer surface forms acute ridges with the orbital surface and the hinder surface. The upper and outer surface continues till near the postfrontal. The orbital surface and the hinder surface converge downwards, giving the bone the shape of a thin wedge. The postorbitals form high ridges along the parietals.

Dimensions :

Distance between the two ends of the postorbital.....	151 mm.
Greatest height of the orbital surface.....	33 mm.
Breadth of the upper and outer surface.....	17 mm.
Mutual distance of the front ends of the postorbitals...	222 mm.
Mutual distance of the hinder ends of the postorbitals..	112 mm.

(This is double the distance between the hinder end of the left postorbital to the hinder end of the mutual suture of the parietals; the hinder end of the right postorbital is still covered by matrix.)

The proportion of the two last dimensions is in *Putterilli* as 2 to 1 and in *latirostris* as 2,7 to 1. In *Putterilli* therefore, the distance between the hinder ends of the postorbitals is not only absolutely but also relatively larger than in *latirostris*.

It will be seen that the skull of *Mccaigi* is much narrower across the lower ends of the postorbitals than *Putterilli*.

THE PREPARIETAL.

The sutures around the preparietal are not clearly visible, and consequently the dimensions cannot be given accurately (Pl. XI). The upper surface, which is the only one visible, is strongly concave antero-posteriorly and less so in any other direction. The suture with the frontals is marked by a broad, thick ridge. This ridge does not protrude above the level of the parietal foramen and the hinder end of the mutual suture of the frontals. As in *latirostris* the preparietal is situated wholly behind a line which connects the upper and hinder corners in the edges of the orbital cavity.

The parietal foramen is oval-shaped.

Length of the preparietal, probably	40 mm.
Breadth of the preparietal, probably	35 mm.

THE PARIETALS.

Only the upper surfaces of the parietals are visible, and their delimitation is not clear. The smallest breadth of the upper surface of both parietals is 44 mm., which is much more than twice that breadth in *latirostris*.

THE SQUAMOSALS.

These bones do not deviate from the already known shape.

THE LOWER JAW.

The lower jaw has been sadly damaged. It has broken in three parts. The right ramus is broken just behind the outer portion of the angular and the left ramus across the hinder end of the surangular. The upper part of the dentary is also broken off. The hinder end of the left ramus has not been found. The front part of the jaw has been displaced and is now situated to the right of the skull with the hinder end of the right angular on the right maxillary and the hinder end of the left angular in front of the alveolar border (Pls. XI, XII). The hinder part of the right ramus is lying upside down across the front of the right quadrate (Pl. XI).

The described parts show the same general features as the lower jaw described in 6. Everything is of course much larger and more massive. The two grooves on the front surface of the symphysis are broad and run right down to the opercular. The ridge on the dentary, parallel to the alveolar border and starting behind the middle of the depression for the tooth, is in this instance really to be taken as a thickened upper and front border of the outer opening of the vacuity in the jaw. The grooves on the upper border of the dentary are deep and broad. The upper connection of the two parts of the angular is beautifully shown in the right ramus and also the sutural ridges of the inner portion which support the prearticular. The prearticular is broad in front and becomes narrower backwards. The articulation part shows the usual shape. The prearticular forms a large lower process to the hinder extremity of the jaw.

Dimensions :

Greatest breadth of the jaw across the symphysis.....	65 mm.
Height of the remaining part of the symphysis.....	83 mm.
The height of the complete symphysis must have been about	100 mm.
Length of the jaw approximately.....	210 mm.
Height of the hinder end of the outer portion of the angular.....	50 mm.
Breadth of the articulation part (with inner process)....	40 mm.
Thickness of ramus over the outer ridge on the dentary	37-40 mm.

THE VERTEBRAL COLUMN.

There is not much left of the vertebral column and the ribs. Only a few of the vertebrae have been found and these are scattered among the other bones. A few ribs are packed together directly behind the skull and a few others are lying to the left of the left ilium. This material is not in a condition to add anything further to our knowledge.

One part of the fossil gives the impression of being the sacrum, but it is so badly preserved that nothing further can be said about it (Pl. XI).

THE SHOULDER GIRDLE.

The distal part of the left scapula and the proximal part of the right one are visible. The shoulder girdle is further represented by the

sternum, the right coracoid and precoracoid, and the left clavicle. Excepting the scapulae, all these parts are well preserved and exposed (Pl. XII).

The Scapula.—Judging from the exposed proximal end of the right scapula, this must have been a bone of great size. The articulation surface has been damaged. The acromion is also broken, but still projects 12 mm. from the bone. The breadth of this proximal end has exceeded 78 mm. It is still in contact with the right humerus and nearly so with the right coracoid.

The Coracoid and Precoracoid.—These two bones are firmly in contact with each other. They both show their outer surface. The precoracoid has more or less the shape of a quadrangle, while the coracoid has the shape of a quadrangle with a triangle attached to one of its long sides, the other long side forming the connection with the precoracoid. The hinder end of the coracoid, the triangle part, is bent inwards. The outer edge of the precoracoid is deeply notched. The front and inner edges of the bone are fairly straight.

The Sternum.—This is a large, broad, and relatively thin bone. In front it is bordered by a straight edge, which is sided by two edges at an angle of about 120 degrees. Laterally these round off into the hinder lateral edges, which converge backwards, enclosing an angle of about sixty degrees. The hinder end of the sternum is slightly notched.

The outer surface of the sternum is not flat. A ridge extends from the notch in the hinder end towards the middle of the bone, where it terminates, the surface between this point and the front edge being slightly transversely hollow. The remaining parts of the front half of the bone, those lying behind the front lateral edges, are slightly convex, the axes of these convexities meeting the front end of the central ridge in the middle of the bone. Behind these convexities the surface of the bone is sharply concave, becoming almost flat further backwards. All these features have also been noticed, although much less conspicuous, in a smaller sternum of another species, probably of *Lystrosaurus*.

The Clavicle.—This is a long slender bone. The median end is broad and flat. There is a slight curve in the bone, near to this end, directing the lateral end more forwards. The lateral end is missing.

Dimensions :

Length of the coracoid.....	72 mm.
Breadth of the coracoid.....	68 mm.
Length of the precoracoid.....	57 mm.
Breadth of the precoracoid	72 mm.
Length of the sternum.....	140 mm.
Breadth of the sternum.....	140 mm.
Length of the remaining part of the clavicle.....	200 mm.
Breadth of the median end.....	38 mm.
Breadth at the curve.....	13 mm.

THE FORE-LIMBS.

Both the humeri are present, but it is doubtful whether any other bones of the fore-limbs are preserved. There is a bone half buried under

the questionable sacral mass, which might be an ulna, but which is so disfigured through fossilization that it cannot be identified.

The Humerus.—I have nothing to add from the present specimens to the description of the humerus of *Dicynodon pardiceps* in 1, p. 43, Pl. XLI and XLII. Fossilization has coalesced some other bones, probably ribs, to the distal part of the right humerus.

Dimensions :

Length of right humerus..... 195 mm.

Breadth of distal end of left humerus, more than..... 115 mm.

(Part of the radial side is broken off.)

Breadth of the proximal end of the right humerus..... 80 mm.

THE PELVIS.

Only the two ilia have been found. The left ilium is lying with its outside up, while the right shows its inner surface (Pl. XI). The outer surface is slightly concave and the inner surface slightly convex. The bone consists of two parts, the acetabular portion being small and thick, the other large and flat. The flat part has the shape of an oblique segment of an ellipse, the acetabular portion uniting with it mainly behind the middle of the straight line. The angle between the lower edge of the flat portion and the front surface of the acetabular connection is obtuse, the angle between this edge and the hinder surface being acute. The upper edge of the bone is notched in different places, but I am not sure about the number of notches. WATSON mentions three notches in the ilium of *latirostris* (3, p. 291), but the present species seems to have five notches in the upper edge of the bone. The left ilium is the only one to give evidence on this point, as the fore-end of the right one is broken off. As in *latirostris*, there are two deep notches opposite the acetabulum. There is a much smaller notch about half-way between the hindmost of the two large ones and the hinder end of the bone. There is probably another notch a little further than the distance between the two large notches forward. This part of the right ilium is damaged and the left one shows at this spot a hole at a small distance from the edge. This hole must be the inner end of a notch, of which the outer end has been covered by substance of some other bone. This kind of deformation is present in more parts of the fossil. As already stated, ribs have coalesced with the right humerus in such a way as to make the distal part of this bone practically unrecognisable. There is still another small notch a little further forwards.

The inner surface of the ilium shows two depressions, situated near the front part of the junction of the acetabular with the flat portion. These depressions are divided by a short narrow ridge, while the hinder border of the hindmost of the two is formed by an identical ridge. Downwards they are bordered by the vertical edge of the general surface; upwards they are not demarcated from this surface. Behind these two there are two other depressions, which are much shallower and much less conspicuous. The distal ends of the sacral ribs were lodged in these cavities and it is clear that two of them, presumably the first two, formed a much firmer connection with the ilium than the rest.

The acetabular portion is a little longer than broad, while its height



Lystrosaurus putterilli. Side view of Skull. $\times \frac{6}{10}$.



Lystrosaurus Putterilli. Upper view of remains. $\times 0.2$.



Lystrosaurus Putterilli. Lower view of remains. $\times 0,3$.

is about the same as its breadth. It shows three facets, a large one for articulation with the femur, a very much smaller one for articulation with the ischium and a still smaller one for the pubis. All these facets are concave.

THE HIND-LIMBS.

Two femurs, the proximal end of a tibia, a bone which might be a fibula, and two tarsals, are the only bones recognised as belonging to the hind-limbs (Pl. XI).

The Femur.—This a long bone with a broad proximal and distal end, the shaft being very narrow. The proximal articulation surface is broad and rounded on the inner side of the bone, becoming narrower towards the middle and gradually rounding down into a powerful ridge, running down the outer side of the bone for more than a third of its length. The front surface of the proximal end is hollow. The distal end is broad and seems to be thick.

Dimensions :

Length.....	212 mm.
Great st breadth of the proximal end.....	94 mm.
Greatest breadth of the distal end.....	72 mm
Narrowest part of the shaft.....	30 mm.

The Tibia.—The proximal end of the tibia is nearly as broad as the distal end of the femur, the breadth being 66 mm. Distally it rapidly contracts to a breadth of 22 mm., where the distal end is broken off.

The Fibula.—This bone is broad and flat proximally, while the distal end, which seems to be somewhat distorted, is thicker and not so broad. The shaft is slightly narrower than the distal end. The length of the bone is 137 mm., the breadth of the proximal end 52 mm., its thickness 14 mm., and the breadth of the shaft 27 mm.

I have much pleasure in naming this new form after its discoverer, Mr. A. W. PUTTERILL of Harrismith, Orange Free State. My thanks are due to the Director of the Albany Museum for the permission to examine the skull of *L. Mccaigi*.

LITERATURE.

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EXPLANATION OF PLATES.

Plate X.

Side view of the skull of *Lystrosaurus Putterilli*.

Plate XI.

Upper view of the remains of *Lystrosaurus Putterilli*. The frontoparietal plane is not parallel with the paper.

Plate XII.

Lower view of the remains of *Lystrosaurus Putterilli*, showing sternum, coracoid, precoracoid, clavicle, and the palatal surface of the premaxillary.
